

WHAT IS CLAIMED IS:

1. Method of bonding metal shells to form a vessel having an interior void, the method

comprising:

forming each of the metal shells with a peripheral flange;

aligning the metal shells with one another such that their respective peripheral flanges are

engaged with one another;

assembling the aligned metal shells with tooling to engage the flanges; and

applying compression force to the flanges, via the tooling, at an elevated temperature so  
as to form a diffusion bond joint where the flanges meet.

2. The method of bonding recited in claim 1, wherein the region where the flanges  
engage one another defines a bond region, and wherein the compression force is applied broadly  
across the flanges so as to cover at least the bond region.

3. The method of bonding recited in claim 1, wherein the bond joint is formed entirely  
over the region where the flanges engage one another.

4. The method of bonding recited in claim 1, wherein the metal shells are formed of  
beryllium or a beryllium alloy.

5. The method of bonding recited in claim 1, wherein the elevated temperature is in the  
range of about 1700° F to 1750° F.

6. The method of bonding recited in claim 1, wherein the compression force is in the  
range of about 2000 psi to 2500 psi.

1 7. A metal bond joint for use with hollow articles formed from metal shells, the bond  
2 joint comprising:  
3 a pair of opposed flanges in contact with one another, each of the opposed flanges being  
4 disposed at the periphery of one of the metal shells, the flanges being aligned with one another  
5 and defining a bond region where they are in contact with one another; and  
6 a diffusion bond between the pair of opposed flanges, formed across the entire bond  
7 region.

1 8. The metal bond joint recited in claim 7, wherein the flanges are shaped such that a  
2 gap, preventing contact of the flanges with one another, is formed in an area between the shells  
3 so as to prevent the bond region from extending into the area between the shells.

1 9. The metal bond joint recited in claim 7, wherein the bond joint is free of filler metal.

1 10. The metal bond joint recited in claim 7, wherein the metal of the bond joint is  
2 homogeneous.

1 11. The metal bond joint recited in claim 7, wherein the bond joint is formed of  
2 beryllium or a beryllium alloy.

1 12. The metal bond joint recited in claim 7, wherein the diffusion bond is formed by  
2 applying compression force to the flanges at an elevated temperature.

1 13. The metal bond joint recited in claim 12, wherein the elevated temperature is in the  
2 range of about 1700° F to 1750° F.

1           14. The metal bond joint recited in claim 12, wherein the compression force is in the  
2 range of about 2000 psi to 2500 psi.

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1           15. A hollow metal article comprising:

2           a pair of opposed metal shells, and

3           a metal bond joint, the bond joint comprising:

4           a pair of opposed flanges in contact with one another, each of the opposed flanges being

5           disposed at the periphery of one of the metal shells, the flanges being aligned with

6           one another and defining a bond region where they are in contact with one another;

7           and

8           a diffusion bond between the pair of opposed flanges, formed across the entire bond

9           region.

1           16. The hollow metal article recited in claim 15, wherein the flanges are shaped such that  
2 a gap, preventing contact of the flanges with one another, is formed in an area between the shells  
3 so as to prevent the bond region from extending into the area between the shells.

1           17. The hollow metal article recited in claim 15, wherein the bond joint is free of filler  
2 metal.

1           18. The hollow metal article recited in claim 15, wherein the metal of the bond joint is  
2 homogeneous.

1           19. The hollow metal article recited in claim 15, wherein the bond joint is formed of  
2 beryllium or a beryllium alloy.

1           20. The hollow metal article recited in claim 15, wherein the diffusion bond is formed by  
2           applying compression force to the flanges at an elevated temperature.

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1           21. A homogeneous bond joint for use with hollow beryllium articles formed from  
2           beryllium shells, the bond joint comprising:

3           a pair of opposed beryllium flanges in contact with one another, each of the opposed  
4           flanges being disposed at the periphery of one of the beryllium shells, the flanges being aligned  
5           with one another and defining a bond region where they are in contact with one another; and

6           a diffusion bond between the pair of opposed flanges, formed across the entire bond  
7           region;

8           wherein the flanges are shaped such that a gap, preventing contact of the flanges with one  
9           another, is formed in an area between the shells so as to prevent the bond region from extending  
10          into the area between the shells;

11          wherein the diffusion bond is formed by applying compression force to the flanges at an  
12          elevated temperature.